The Effects of Conversion of Native Rangeland to Exotic Grass Pasture on Ant Assemblages in Sonora, Mexico

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Fig.1: Native Sonoran rangeland (left), buffelgrass pasture (right)

Introduction

Buffelgrass (*Pennisetum ciliare*), a perennial grass native to Africa, has been widely introduced into Sonora, Mexico in order to increase cattle production on degraded rangeland. Conversion of native rangeland to buffelgrass pastures begins with removal of nearly all vegetation followed by seeding with buffelgrass. The resulting buffelgrass pastures differ dramatically from native rangeland in numerous biophysical parameters (figure 1). Recent estimates indicate that nearly 10% of the land area of Sonora may have been converted to buffelgrass pastures[1,2], yet there has been little research into the environmental impacts of this large scale landscape change.

Objectives

There is widespread concern that buffelgrass will have negative impacts on regional biodiversity and ecosystem functioning. In order to effectively manage Sonoran rangelands to preserve biodiversity and ecosystem functions, we require basic information concerning the distribution of buffelgrass and its impact on native flora and fauna. Ants are one of the most abundant and diverse taxa in Sonora and play important roles in many ecosystem processes in this subtropical, semi-arid environment. With this in mind, the objectives of this research are to compare the abundance, diversity, and composition of ant assemblages on rangeland cleared and sowed with buffelgrass to those of uncleared native rangeland.

1. Franklin, K. K. Lyons, P. Nagler, D. Lampkin, F. Molina, E. Glenn, T. Markow, and A. Huete. 2006. Buffelgrass (*Pennisetum ciliare*) Land Conversion and Productivity in the Plains of Sonora, Mexico. Biological Conservation. 127:62-71.

2. SEMARNAT. 2006. Response to an official request for data concerning the total number of hectares converted to buffelgrass pastures in Sonora. SEMARNAT/UCPAST/DGAACT/06/077. September 26, 2006.

Methods

•Eighteen buffelgrass pastures of various ages were located along a precipitation gradient in central Sonora. Each buffelgrass pasture was paired with a nearby area of native rangeland.

•The ant assemblages of each study site were sampled once with 36 pitfall traps operated for 72 hours during the monsoon season. Pitfall traps were separated by a minimum of 15 meters.

•Ants were sorted to species. Abundance data were converted to incidence data for analysis. Only preliminary data for 20 of 36 sites are shown here.

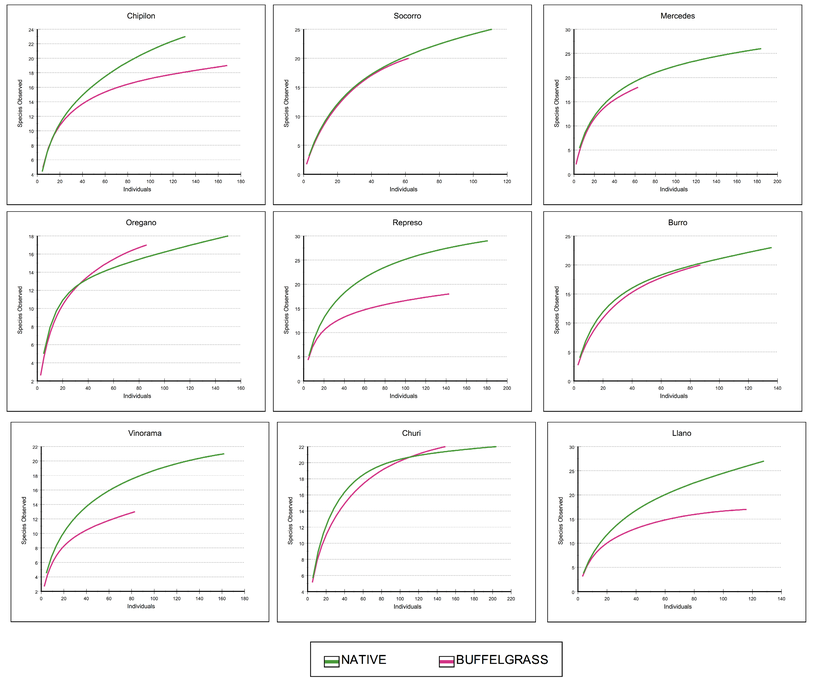
Abundance

Table 1: Cumulative number of species incidences for each site.

Site	Native	Buffelgrass	Difference
Chipilon	131	167	-36
Oregano	154	86	68
Represo	181	144	37
Socorro	111	63	48
Burro	139	88	51
Llano	133	119	14
Mercedes	184	68	116
Vinorama	162	83	79
Aigame	159	146	13
Churi	204	149	55

The number of species incidences was greater in native rangeland than in buffelgrass pastures. There is substantial evidence that the difference (-44.5) is nonzero (p=0.008). Given the spacing among pitfall traps, this difference indicates that the abundance of ant nests is greater in native rangeland.

Species Richness: Species Accumulation Curves



Species Richness: Chao 2 Estimates

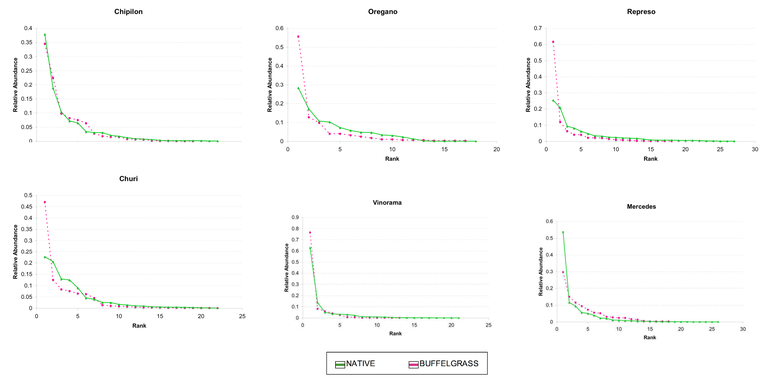
Table 2: Chao 2 estimates of species richness for each study site.

Site	Native	Buffelgrass	Difference
Chipilon	28	25	3
Oregano	31	19	12
Represo	34	22	12
Socorro	33	22	11
Burro	33	24	9
Llano	57	17	40
Mercedes	32	23	9
Vinorama	23	21	2
Aigame	21	34	-13
Churi	24	24	0

Chao 2 estimates of species richness are higher for native rangeland in all but one case. There is weak evidence that the difference is nonzero (p_9 = .08). The strength of the evidence increases if the anomalous case is excluded (p=0.02) .

Rank Abundance Distributions

Relative abundance distributions suggest that species abundances are distributed more evenly in native rangeland than in buffelgrass pastures. On average the most abundant species in a buffelgrass pasture accounts for over 50% of all collected specimens, compared to less than 40% in native rangeland. A portion of this data is shown below.



Conclusions

Preliminary data suggests that land conversion to buffelgrass pastures results in decreased abundance, species richness, and evenness of ant assemblages in Sonoran rangelands. Sonoran rangelands harbor an extremely diverse ant fauna, and species accumulation curves indicate that sampling for species richness is incomplete. Species richness estimates may be used to partly overcome this shortfall. Rank abundance distributions suggest greater evenness in native rangeland. Additional data and analyses will likely provide a better understanding of the effects of land conversion to buffelgrass pastures on ant assemblages in Sonora, Mexico.

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